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BRITISH STANDARD

BS EN
1175-2:1998

Safety of industrial trucks — Electrical requirements —

Part 2: General requirements for internal combustion engine powered trucks

The European Standard EN 1175-2:1998 has the status of a British Standard

ICS 53.060

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National foreword

This British Standard is the English language version of EN 1175-2:1998.

The UK participation in its preparation was entrusted to Technical Committee MHE/7, Industrial trucks, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 6, an inside back cover and a back cover.

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 May 1998

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1175-2

January 1998

ICS 53.060

Descriptors: Industrial trucks, heat engines, safety of machines, accident prevention, hazards, tests, electrical installation, design, control devices, protection against electric shocks, wiring, utilization, information

English version

Safety of industrial trucks — Electrical requirements — Part 2: General requirements of internal combustion engine powered trucks

Sécurité des chariots de manutention — Prescriptions électriques — Partie 2: Prescriptions générales des chariots équipés d'un moteur thermique

Sicherheit von Flurförderzeugen — Elektrische Anforderungen — Teil 2: Allgemeine Anforderungen für Flurförderzeuge mit Verbrennungsmotoren

S

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 150 "Industrial trucks — Safety", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

This European Standard is one of a package of standards for the safety of industrial trucks:

prEN 1726, *Safety of machinery — Industrial trucks — Self propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull up to and including 20 000 N.*

prEN 1726-2, *Safety of industrial trucks — Self propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull up to and including 20 000 N — Part 2: Additional requirements for trucks with elevating operator position and trucks specially designed to travel with elevated load.*

prEN 1551, *Safety of industrial trucks — Self propelled trucks over 10 000 kg capacity.*

prEN 1459, *Safety of industrial trucks — Variable reach trucks.*

prEN 1757-1, *Safety of industrial trucks; pedestrial controlled manual and semi manual trucks — Part 1: Stacker trucks.*

prEN 1757-2, *Safety of industrial trucks; pedestrial controlled manual and semi manual trucks — Part 2: Pallet trucks with lift height up to 300 mm.*

prEN 1757-3, *Safety of industrial trucks; pedestrial controlled manual and semi manual trucks — Part 3: Platform trucks.*

prEN 1757-4, *Safety of industrial trucks; pedestrial controlled manual and semi manual trucks — Part 4: Scissor lift pallet-trucks.*

EN 1525, *Safety of industrial trucks — Driverless trucks and their systems.*

EN 1175-1, *Safety of industrial trucks — Electrical requirements — Part 1: General requirements for battery powered trucks.*

EN 1175-2, *Safety of industrial trucks — Electrical requirements — Part 2: General requirements for internal combustion engine powered trucks.*

EN 1175-3, *Safety of industrial trucks — Electrical requirements — Part 3: Specific requirements for the electric power transmission systems of internal combustion engine powered trucks.*

EN 1526, *Safety of industrial trucks — Automated functions of trucks.*

prEN 1755, *Safety of industrial trucks — Operation in potentially explosive atmospheres; Use in flammable gas, vapour, mist and dust.*

prEN 12053, *Safety of industrial trucks — Test methods for measuring noise emission.*

prEN ISO/DIS 13564, *Test method for measuring visibility from self-propelled trucks.*

prEN 13059, *Safety of industrial trucks — Test methods for measuring vibration.*

prEN 12895, *Industrial trucks — Electromagnetic compatibility.*

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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0 Introduction

This European Standard is a type C standard as stated in EN 292-1. This standard has been prepared to be a harmonized standard to provide one means of conforming with the electrical aspects of the Essential Safety Requirements of the Machinery Directive and associated EFTA Regulations. Electrical installations complying with this standard are deemed to satisfy these requirements.

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery should comply as appropriate with EN 292 for hazards which are not covered by this standard.

1 Scope

1.1 This standard specifies the electrical and related mechanical safety requirements for the design and construction of the electrical installation in internal combustion engine powered trucks (hereinafter referred to as "trucks") with starter battery nominal voltages up to and including 24 V.

NOTE 1 Part 3 of this standard details specific electrical requirements for electrical power transmission systems of internal combustion engine powered trucks.

NOTE 2 Reference is made to this standard in other standards which cover the non-electrical requirements of the various industrial truck types.

NOTE 3 This standard does not address the subject of electromagnetic compatibility (EMC).

NOTE 4 The special requirements for operation in potentially explosive atmospheres are not covered in this standard.

1.2 The requirements of this standard are applicable, when trucks are operated under the following climatic conditions:

— Maximum ambient temperature, continuous duty:	+ 40 °C;
— Lowest ambient temperature:	− 20 °C;
— Service altitude:	up to 2 000 m;
— Relative humidity:	in the range 30 % to 95 % (non-condensing).

1.3 This standard covers specific hazards which could occur during the intended use of trucks. For hazards occurring during construction, transportation, commissioning, de-commissioning and disposal, reference should be made to EN 292.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1:1991, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology.*

EN 292-2:1991, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*

EN 954-1:1996, *Safety of machinery — Safety related parts of control systems — Part 1: General principles for design.*

EN 1050:1996, *Safety of machinery — Principles for risk assessment.*

EN 60947-5-1:1991, *Low-voltage switchgear and controlgear — Part 5: Control circuit devices and switching elements — Section one: Electromechanical control circuit devices* (IEC 947-5-1:1990)

ISO 5053:1987, *Powered industrial trucks — Terminology*

3 Definitions

For the purposes of this standard, definitions given in ISO 5053:1987 apply together with the following:

3.1

nominal battery voltage

the total number of battery cells connected in series multiplied by 2 V for conventional lead acid batteries and by 1,2 V for alkaline batteries. For other types of batteries corresponding definitions apply

4 List of hazards

The following significant hazards from annex A of EN 1050:1996 (within brackets) are applicable in the situations described and could involve risks to persons if not reduced or eliminated. The corresponding requirements are designed to limit the risk or remove the hazard in each situation.

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Hazard		Corresponding requirements	
4.1	Mechanical hazards (1)		
4.1.1	Crushing hazard (1.1)	**5.1.2**	Battery constraint
4.1.2	Impact by collision (1.6)	**5.3.4**	Speed limitation
4.1.2.1	— when driven by the operator	**5.3.5**	Steering control
4.1.3	Loss of stability (1.11)		
	— from excess speed		
	— from faulty battery mass		
4.2	Electrical hazards (2)	**5.1.1**	Battery insulation
4.2.1	Electric shock (2.1)	**5.2**	Protection of circuits
4.2.2	Short circuit	**5.4.1**	Protection
4.2.3	Overloading	**5.4.2**	Cross-sectional area
		5.4.3	Specification
		5.4.5	Mechanical protection
		5.4.6	Wiring that flexes
		5.5	Protection against electric shock
4.3	Hazards generated by substances (7)	**5.1.2**	Battery constraint
		5.4.4	Fuel leakage
4.4	Ergonomic hazards (8)	**5.4.7**	Identification
4.4.1	Human error (8.6)	**6**	Information for use
4.4.1.1	— when the truck is serviced		
4.5	Hazards due to functional disorders (10)	**5.1.3**	Battery disconnection
		5.2	Protection of circuits
		5.3.1	Low voltage
		5.3.2	Frame faults
		5.3.3	Load handling control
		5.3.4	Speed limitation
		5.3.5	Steering control
		5.4.3	Specification
		5.4.4	Fuel leakage
		5.4.5	Mechanical protection
		5.4.6	Wiring that flexes

5 General requirements

5.1 Starter battery

5.1.1 *Insulation*

Any live parts of the battery not connected to the frame shall be insulated.

5.1.2 *Constraining*

Batteries of all trucks shall be constrained to prevent displacement which may give rise to danger.

5.1.3 *Disconnection*

Trucks shall be so designed and constructed that the battery can be electrically disconnected with the aid of an easily accessible device e.g. a switch or connector.

Disconnectable battery terminals satisfy this requirement providing the terminals are accessible without the use of a key or tool.

5.2 Protection of circuits

Control and auxiliary circuits shall be fuse protected against short circuit conditions and dangerous excess current. Several auxiliary circuits in parallel, with combined rated current not exceeding 12 A, may be protected by a single device.

5.3 Safety related control systems

5.3.1 *Low voltage*

Electrical control systems shall be so designed that all functions operate and safety is not jeopardized if the voltage should fall below the nominal battery voltage by as much as 15 %.

NOTE Where a system is required to function during engine starting condition, special precautions can be required.

5.3.2 *Frame faults*

The electric circuits shall be so designed or protected, that frame faults shall not cause inadvertent movements that cannot be controlled by the driver.

5.3.3 *Load handling control*

Electrical and electronic control load handling systems shall be arranged so that in case of a fault the load handling movement can be stopped. The safety related parts shall be in accordance with category 1 in EN 954-1:1996.

This requirement is not necessary where the movements are controlled by some other means, e.g. direct manually operated hydraulic valves.

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5.3.4 *Speed limitation*

For limiting or reducing the speed of a function on trucks designed to travel with an elevated operator and/or load for stability reasons the following shall apply.

a) The electrical and electronic circuits shall be so designed and fitted that in the event of electrical faults, the speed limitation is preserved or the motion shall be brought to a controlled stop. Restarting shall not be possible until the circuit has been restored. Where it is not possible to satisfy the above requirements by a simple electrical or electronic circuit, the electrical or electronic circuits may be duplicated. Facilities shall be provided to check the correct functioning at service intervals in accordance with the manufacturer's instructions.

The safety related parts shall be in accordance with category 2 in EN 954-1:1996.

b) Mechanically operated switches may be of a positive action type in accordance with EN 60947-5-1:1991 such that they disconnect the circuit. Other switches can be used providing the system meets the safety requirements in a) (above).

5.3.5 *Steering control*

Electrical and electronic steering control systems shall be arranged so as to avoid operation of the steering system unrelated to the manual input during travel. Any electrical or electronic fault capable of producing the above condition shall be detected and the steering assistance de-energized within 0,1 s. Where the power steering system is fully dependent on the electrical power source, the truck shall also be brought to a controlled stop automatically. It shall be possible to check the operation of the safety circuit of this system at service intervals in accordance with the manufacturer's instructions. The safety related parts shall be in accordance with category 3 in EN 954-1:1996.

5.4 Wiring practices, conductors and electrical components

One pole of the electrical system may be connected to the truck frame.

5.4.1 *Protection*

All conductors not connected to the truck frame shall be either effectively insulated and where necessary protected against thermal and mechanical damage or shall be so placed and safeguarded as to avoid danger when the truck is in its normal operating condition.

5.4.2 *Cross-sectional area*

The cross-sectional area of conductors shall be so selected that during operation of the truck the temperature does not exceed the temperature rating of insulation used.

5.4.3 *Specification*

Copper conductors external to enclosures (excluding short connections between electric or electronic components and wires that are an integral part of a proprietary component) shall be:

a) flexible;

b) of cross-sectional area not less than:

1) for control wiring 0,50 mm^2;

2) for signal wiring 0,30 mm^2;

3) for data communication wiring and for conductors of adequately supported copper multicore cables and wiring harnesses 0,08 mm^2;

c) of cross-sectional area not less than 1,00 mm^2 for single wires not incorporated into a harness or extending from the harness more than 250 mm.

Conductors of other materials shall be selected and sized to give equivalent performance.

5.4.4 *Fuel leakage*

Wiring and electrical components shall be designed, placed or protected to minimize hazards arising from leakage from the fuel system, such as contamination and fire.

5.4.5 *Mechanical protection*

Where wiring passes through metal parts of the frame or enclosures, the holes shall be fitted with insulating bushes or the wiring protected by some other equivalent means.

5.4.6 *Wiring that flexes*

Wiring that flexes during normal operation of the truck functions shall be relieved of mechanical strain at their electrical termination.

5.4.7 *Identification*

Wires, cables, terminals etc. shall be identified by codings in accordance with the electrical diagram included in the service manual.

5.5 Protection against electric shock

Exposed high tension ignition terminals on trucks shall be protected against direct contact by barriers or insulated caps.

6 Information for use

NOTE The main information for use is detailed in the truck standards as listed in the foreword. The following are additional requirements.

6.1 Electrical diagram

An electrical diagram (which shall include nominal battery voltage and where applicable, frame polarity) shall be included in the service manual. Connection points for auxiliary lighting shall be indicated.

6.2 Safety checks

Methods and intervals for checking safety systems shall be included in the service manual or instruction handbook.

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Annex A (informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential safety requirements of EU Directives 89/392/EEC as amended by 91/368/EEC, 93/44/EEC and 93/68/EEC.

WARNING: Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard are likely to support requirements of the above referred Directive.

Compliance with this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

Table ZA.1 — Essential health and safety requirements

Clauses in annex A of EN 292-2/A1:1995	Corresponding clauses in this standard
1.2.1 Safety and reliability of control systems	**5.3**
1.2.6 Failure of the power supply	**5.3.1**
1.2.7 Failure of the control circuit	**5.3.2, 5.3.3, 5.3.4, 5.3.5**
1.3.1 Stability	**5.3.4**
1.3.3 Risks due to falling or ejected objects	**5.1.2**
1.5.1 Electricity supply	**5.1.1, 5.2, 5.4, 5.5**
1.5.4 Errors of fitting	**5.4.7, 6.1**
1.5.6 Fire	**5.2, 5.4.4**
1.6.3 Isolation of energy sources	**5.1.3**
1.7.4 Instructions	**6**
4.1.2.1 Risks due to lack of stability	**5.3.4**
6.2.3 Excess speed hazard	**5.3.4**
6.4 Risks of the carrier falling or overturning	**5.3.4**

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